

# PROJECT facts

Environmental & Water  
Resources

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U.S. DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY



## FIELD TESTING OF ACTIVATED CARBON INJECTION OPTIONS FOR MERCURY CONTROL AT TXU's BIG BROWN STATION

### CONTACTS

#### Thomas J. Feeley III

Technology Manager  
Environmental & Water Resources  
412-386-6134  
[thomas.feeley@netl.doe.gov](mailto:thomas.feeley@netl.doe.gov)

#### Sara M. Pletcher

Project Manager  
304-285-4236  
[sara.pletcher@netl.doe.gov](mailto:sara.pletcher@netl.doe.gov)

### PARTNERS

#### University of North Dakota Energy and Environmental Research Center;

Grand Forks, ND

#### TXU Energy,

Dallas, TX

#### Babcock & Wilcox,

Barberton, OH

#### Electric Power Research Institute (EPRI),

Palo Alto, CA

#### ADA-ES,

Denver, CO

### Description

#### Objective

The project objective is to field test a commercially available, standard Darco® activated carbon (AC), a standard AC enhanced with an Energy and Environmental Research Center (EERC) proprietary additive, and a proprietary chemically treated AC at the TXU Power Big Brown lignite-fired station to obtain greater than 55% mercury (Hg) removal. Supporting objectives are to 1) determine the capital and operating costs for Hg removal with several sorbents and 2) determine the balance-of-plant effects when using activated carbon injection (ACI) over approximately a one-month period.

#### Background

Despite the fact that Hg regulations for coal-fired utilities have been promulgated, significant issues must be resolved. Significant data gaps exist for lignite and Power River Basin (PRB) sub-bituminous coals and blends, which represent almost 50% of the coal fired in the United States.

Lignite is unique because of its highly variable ash content, ash rich in alkali and alkaline-earth elements, high moisture levels, and low chlorine (Cl) content. Compared to bituminous coals, lignite coals typically contain similar or higher levels of Hg but significantly lower levels of Cl (often well below 200 ppm) whereas bituminous coals often have Cl levels in excess of 1000 ppm. Lignite coals are also distinguished by much higher calcium content. Unique to Texas lignite coal are relatively higher iron and selenium concentrations.

These differences in composition have important effects on the form of Hg emitted from a boiler and on the capabilities of different control technologies to remove Hg from flue gas. Coal containing Cl levels greater than 500 ppm (Appalachian and IL Basin coals), for example, produce Hg in flue gas dominated by more easily removable oxidized compounds.

### Summary

The TXU Power Big Brown Station near Fairfield, TX will be the host site for this large scale field testing project. Big Brown operates two tangentially fired 600-MW boilers with eight coal feeders per unit. The plant typically burns Texas Lignite or a Texas Lignite/Powder River Basin sub-bituminous coal blend. Low NO<sub>x</sub> burners are installed on the boilers and a COHPAC™ configuration is utilized for



## COST

### Total Project Value

\$2,226,944

### DOE/Non-DOE Share

\$1,500,000 / \$726,944

## PERIOD OF PERFORMANCE

March 2005 to  
March 2007

## ADDRESS

### National Energy Technology Laboratory

626 Cochran's Mill Road  
P.O. Box 10940  
Pittsburgh, PA 15236-0940  
412-386-4687

3610 Collins Ferry Road  
P.O. Box 880  
Morgantown, WV 26507-0880  
304-285-4764

One West Third Street, Suite 1400  
Tulsa, OK 74103-3519  
918-699-2000

539 Duckering Bldg./UAF Campus  
P.O. Box 750172  
Fairbanks, AK 99775-0172  
907-452-2559

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**1-800-553-7681**

## WEBSITE

[www.netl.doe.gov](http://www.netl.doe.gov)

particulate control. ACI will occur between the electrostatic precipitator and baghouse, which make up the COHPAC™ particulate control unit.

This project will enhance the capability of ACI to remove Hg from lignite blend combustion gases to achieve a high level of cost-effective control for this challenging coal. A benefit of this technology, among others, is that it will allow ACI after the ESP; therefore, only a small percentage of the ash will be impacted by the additional AC, allowing the majority of the ash to be sold. Additionally, the results of this effort may be applicable to virtually all utilities burning lignite in the United States and Canada, but especially those burning Texas lignite.

## Accomplishments

The contract has been signed and the project kickoff meeting was held. Planning and preparations are underway for testing in early 2006.

## Planned Activities

Testing at Big Brown will first involve establishing baseline Hg levels and removal results followed by three weeks of parametric testing involving the measurement of Hg removal with standard ACI, standard ACI enhanced with an additive, and pretreated ACI. Five weeks of long-term testing will be conducted to allow evaluation of performance, preliminary economics, and balance of plant impacts for the most promising technology option.

For parametric testing, Tests 1–4 will be conducted with commercially available Darco® Hg AC to determine the rate needed to achieve the desired Hg reduction. Once that is established, Tests 5–8 will optimize the use of the additive, while minimizing the amount of AC (Darco® Hg) needed and overall cost. Similar to Tests 1–4, Tests 9–12 will determine the rate of chemically pretreated AC needed to achieve the desired Hg reduction. For all tests, a maximum ACI rate of 10 lb/Macf will apply.

Following parametric testing, long-term testing will be conducted for five consecutive weeks. The longer-term test will be at a set AC (and, possibly, additive) feed rate targeted at a Hg removal efficiency of 50%–70%, with an overall time-average target of >55%.

A preliminary economic analysis will then be performed using the test data to assess costs for implementing a sorbent-based injection system for Hg control. These results will allow determination of commercial economics for Hg removal, quantification of the balance of plant impacts of the control technology, and investigation of the commercialization potential.



TXU Energy Big Brown Station.